GAO Discussion Topics / Questions for EPA ORD (104153)

Overview

1. Please provide us with an overview of EPA ORD's roles and responsibilities in terms of dispersant research and use.

2. Please provide us with an overview of EPA ORD's role in ICCOPR.

    a. Does EPA conduct any dispersants-related research outside of ICCOPR?

EPA ORD Research

3. What research has EPA supported related to dispersants since Deepwater Horizon, and what is the purpose of such research?

   Since DWH, EPA has expanded research pertaining to oil behavior, fate and effects. Topics include biodegradation, photodegradation, dispersion, in situ detection and tracking, and expanding the species used in toxicity testing and performed additional tests on dispersants. Some of the research results have been published in peer reviewed scientific journals, and other research that will be published is in progress:

   Journal Articles & Proceedings:

   Barron MG, AC Bejarano, RN Conmy, D Sundaravadivelu, P Meyer. 2020. Toxicity of oil spill response agents and crude oils to five aquatic test species. Mar Poll Bull 153:110954. [HYPERLINK "https://doi.org/10.1016/j.marpolbul.2020.110954" \t "_blank" \o "Persistent link using digital object identifier"]

   Conmy, R.N., L. DiPinto, A. Kukulya, O. Garcia, D. Tulis, D. Sundaravadivelu, M. Gloekler, A. Hall, E. Fischell, D. Gomez-Ibanez (2020) Advances in underwater oil plume detection capabilities. *International Oil Spill Conference Proceedings*: May 2020.

   Conmy, R.N., D. Sundaravadivelu, B.A. Schaeffer, B. Robinson, T. King, R. Grosser, E. Holder (2020) Characterizing dispersion effectiveness at varying salinities. *International Oil Spill Conference Proceedings*: May 2020.

   Ward, C.P., C.J. Armstrong, R.N. Conmy, D.P. French-McCay, C.M. Reddy (2018) Photochemical oxidation reduced the efficacy of aerial dispersants applied in response to the *Deepwater Horizon* oil spill. *Environmental Science and Technology Letters*, 5, 226–231. [HYPERLINK "https://pubs.acs.org/doi/pdf/10.1021/acs.estlett.8b00084"]

   Gao, F., L. Zhao, M.C. Boufadel, T. King, B. Robinson, R.N. Conmy, R. Miller (2017) Hydrodynamics of oil jets without and with dispersant: Experimental and numerical characterization. *Applied Ocean Research* [HYPERLINK "http://dx.doi.org/10.2016/j.apor.2017.08.013"].
   [HYPERLINK "https://www.sciencedirect.com/science/article/abs/pii/S0141118717301839"]

Techtmann, S.M., M. Zhuang, P. Campo, E. Holder, M. Elk, T.C. Hazen, R.N. Conmy, J.W. Santo Domingo (2017) Corexit 9500 enhances oil biodegradation and changes active bacterial community structure of oil-enriched microcosms. *Applied Environmental Microbiology,* 83(10) DOI: 10.1128/AEM.03462-16. [HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/28283527"]

Zhuang, M., G. Abulikemu, P. Campo, W. Platten III, M.T. Suidan, A.D. Venosa, R.N. Conmy (2017*, submitted*) Biodegradability of Different Initial Concentrations of Alaska North Slope Crude Oil Dispersed with Corexit C9500. *Marine Pollution Bulletin.* [HYPERLINK "https://pubs.acs.org/doi/abs/10.1021/es303881h"]

Conmy, R.N., B. Robinson, T. King, M. Boufadel, S. Ryan, C. McIntyre, M.I. Abercrombie, K. Lee (2017) Oil plume simulations: Tracking oil droplet size distribution and fluorescence within high-pressure release jets. *International Oil Spill Conference Proceedings*: May 2017, Vol. 2017, No. 1. [HYPERLINK "https://doi.org/10.7901/2169-3358-2017.1.1230"]

Pan, Z., L. Zhao, M.C. Boufadel, T. King, B. Robinson, R.N Conmy, K. Lee (2017) Impact of mixing time and energy on the dispersion effectiveness and droplets size of oil. *Chemosphere*, 166: 246-254. [HYPERLINK "https://www.ncbi.nlm.nih.gov/pubmed/27700991"]

Gullett, B.K., J. Aurell, A. Holder, W. Mitchell, D. Greenwell, M. Hays, R.N. Conmy, D. Tabor, W. Preston, I. George, J.P. Abrahamson, R. Vander Wal, E. Holder (2016) Characterization of Emissions and Residues from Simulations of the Deepwater Horizon Surface Oil Burns. *Marine Pollution Bulletin,* 117 (1-2), 392-405. [HYPERLINK "https://doi.org/10.1016/j.marpolbul.2017.01.083"]

Conmy, R.N., B.A. Schaeffer, J. Schubauer-Berigan, J. Aukamp, A. Duffy, J. Lehrter, R. Greene (2016) Utility of characterizing light attenuation within Northwest Florida Estuaries: implications for RESTORE Act water quality monitoring. *Marine Pollution Bulletin,* 114, 995-1006. [HYPERLINK "https://www.sciencedirect.com/science/article/pii/S0025326X16309493"]

White, H.K, R.N. Conmy, I.R. MacDonald, C.M. Reddy (2016) Methods of Oil Detection in Response to the Deepwater Horizon Oil Spill. *Oceanography*, 29, 3, 54-65. [HYPERLINK "https://doi.org/10.5670/oceanog.2016.72"]

Li, P., L. Weng, H. Niu, B. Robinson, T. King, R.N Conmy, K. Lee, L. Liu (2016) Reynolds Number Scaling to Predict Droplet Size Distribution in Dispersed and Undispersed Subsurface Oil Releases. *Marine Pollution Bulletin.* [HYPERLINK "http://dx.doi.org/10.1016/j.marpolbul.2016.10.005"]

Zhao, L., F. Shaffer, B. Robinson, T. King C. D'Ambrose, Z. Pan, F. Gao, R.S. Miller, R.N. Conmy, M.C. Boufadel (2016) Underwater oil jet: Hydrodynamics and droplet size distribution. *Chem. Engin. Journal*, 299: 292-303. [HYPERLINK "https://www.infona.pl/resource/bwmeta1.element.elsevier-3c61723e-d5c6-37b4-8289-2c218fab1357"]

Zhuang, M. Abulikemu, P. Campo-Moreno, W.E. Platten, A.D. Venosa, R.N. Conmy (2016) Effect of dispersants on the biodegradation of South Louisiana crude oil at 5 and

25 °C. *Chemosphere,* 144: 767-774. [HYPERLINK "https://doi.org/10.1016/j.chemosphere.2015.08.040"]

Holder, E.L, R.N. Conmy, A.D. Venosa (2015) Comparative laboratory-scale testing of dispersant effectiveness of 23 crude oils using four different testing protocols. *J. Environ. Protection*. 6: 628-639. [HYPERLINK "http://dx.doi.org/10.4236/jep.2015.66057"]

Zhao, L., B. Wang, P.M. Armenante, R.N. Conmy, M.C. Boufadel (2015) Characterization of turbulent properties in the EPA Baffled Flask for dispersant effectiveness testing. *J. Environmental Engineering*. DOI:10.1061/(ASCE)EE.1943-7870.0001000 [HYPERLINK "https://ascelibrary.org/doi/10.1061/%28ASCE%29EE.1943-7870.0001000"]

Conmy, R.N., P.G. Coble, J. Farr, A.M. Wood, K. Lee, S. Pegau, I. Walsh, C. Koch, M.I. Abercrombie, M.S. Miles, M. Lewis, S. Ryan, B. Robinson, T. King, C. Kelble, J. Lacoste (2014) Performance of submersible fluorometers exposed to chemically-dispersed crude oil: wave tank simulations for improved oil spill monitoring and evaluation of Deepwater Horizon spill measurements. *Environmental Science and Technology,* 48, 3: 1803-10. [HYPERLINK "https://pubs.acs.org/doi/10.1021/es404206y"]

Book Chapters:

Venosa, A.D., P.T. Anastas, M.G. Barron, R.N. Conmy, M.S. Greenberg, G.J. Wilson (2014) Science-based Decision Making on the Use of Dispersants in the Deepwater Horizon Oil Spill. In: Oil Spill Remediation: Colloid Chemistry-Based Principles and Solutions.

Reports:

EPA 600/F-16/250 Federal Report (2016) Dispersant Effectiveness, In-Situ Droplet Size Distribution and Numerical Modeling to Assess Subsurface Dispersant Injection as a Deepwater Blowout Oil Spill Response Option *and* Evaluation of Oil Fluorescence Characteristics to Improve Forensic Response Tools; IAA No. E12PG00037 for DOI Bureau of Safety and Environmental Enforcement, 144 pp.,

NOAA Technical Report NOS OR&R 27: Joint Analysis Group for the Deepwater Horizon Oil Spill (2012) Review of Subsurface Dispersed Oil and Oxygen Levels Associated with the Deepwater Horizon MC252 Spill of National Significance, 93 pp; Co-Author and lead for forensic oil detection.

NOAA Technical Report NOS OR&R 24: Joint Analysis Group for the Deepwater Horizon Oil Spill (2011) Review of R/V Brooks McCall Data to Examine Subsurface Oil, 64 pp; Co-Author and lead for fluorescence detection of oil.

NOAA Technical Report NOS OR&R 25: Joint Analysis Group for the Deepwater Horizon Oil Spill (2011) Review of Preliminary Data to Examine Subsurface Oil in the Vicinity of MC252, May 19 to June 19, 2010, 169 pp; Co-Author and lead for fluorescence detection of oil.

NOAA Technical Report NOS OR&R 26: Joint Analysis Group for the Deepwater Horizon Oil Spill (2011) Review of Preliminary Data to Examine Oxygen Levels in the

Vicinity of MC252, May 8 to August 9, 2010, 102 pp; Co-Author and lead for fluorescence detection of oil.

Data Request for Q3: *Summary-level information on the dispersant studies that EPA-ORD has supported since 2010).*

4. What role did EPA play in the commissioning or development of the 2019 NAS study on dispersants?

Document Request for Q4*: Please provide us with EPA's contract with NAS on the study* ((#EP-C-14-005, TO# 17).

5. From your perspective, what are the key findings of the 2019 NAS study?

6. Are there other capstone studies, review papers, or meta-analyses that we should consider during our review?

7. How does EPA ORD coordinate its research efforts with other USG entities, such as NOAA, DOI / BSEE, and DOI / BOEM?

Research Findings and Recommendations

8. To what extent has USG and non-USG research into dispersants resulted in clear findings on: a) efficacy / effectiveness, b) potential human health effects (acute and chronic), and potential animal, plant, and ecosystems effects? If so, please describe such findings.

9. What, if any, are common limitations of research conducted on dispersants in terms of: a) efficacy / effectiveness, b) human health effects (acute and chronic), and animal, plant, or ecosystem effects?

10. What research areas represent gaps in the scientific community's understanding of dispersant use?

11. With regards to dispersants, what are EPA ORD's priority research areas, if any?

EPA Regulations and Policies

12. What regulations related to chemical dispersants is EPA responsible for?

13. Please describe how EPA-supported research becomes incorporated or reflected in EPA regulations or policies.

    a. Is there a formal process for reviewing new research or lessons learned from incidents and whether these merit consideration in EPA regulations and policies?

    b. Please provide specific examples of a scientific finding that resulted in a change to EPA regulations, policies, tools or practices regarding dispersants.

14. How does EPA-funded research inform the guidance, policies, or practices of **other** federal entities performing oil spill response activities or preparedness? Please provide specific examples.

15. What was the intent / purpose of EPA's 2015 proposed revisions to the regulations for dispersants?

16. To what extent did research supported by ORD serve to support or inform the formulation of the 2015 proposed regulations?

17. What were the purported benefits/value to the 2015 proposed revisions to dispersant regulations?

18. What is the status of EPA's 2015 proposed revisions to dispersant regulations?

19. What is EPA ORD's role vis-à-vis the NCP Product Schedule?

    a. To what extent does EPA ORD perform independent testing (in terms of both efficacy and toxicity) of dispersant formulations listed on the NCP Product Schedule?

    b. Has EPA ORD recently recommended any changes to the data submission requirements for inclusion on the NCP Product Schedule or any changes to the testing protocols?